[0034] The present invention allows the production of a wearable system that utilises the changes in resistance of a polymer with a high degree of flexibility and elasticity as a trigger to provide immediate feedback as to whether a movement is being performed correctly or not. This allows the participant to instantly adjust and correct their technique. Hence, the correct technique is quickly learnt and reinforced during the activity. This forms the basis of a highly effective training or rehabilitation program which may be customised and optimised to suit particular activities and participants.

Brief Description of the Drawings

[0035] Preferred embodiments of the present invention will now be described by way of example only with reference to the drawings in which:

[0036] **FIG. 1** shows a schematic representation of a device according to the present invention;

[0037] **FIG. 2***a* shows a schematic representation of equipment used to test conductive polymer coated fabric for use in the present invention;

[0038] **FIG. 2***b* is a graph showing the results of tests conducted on the equipment shown in **FIG. 1**;

[0039] **FIG. 3** shows the circuit diagram of a more sophisticated form of the present invention;

[0040] **FIG. 4***a* is a schematic representation of a U-shaped feedback device; **FIG. 4***b* is a schematic representation of a feedback device with a multi-pronged configuration;

[0041] **FIG. 5** is a schematic representation of a feedback device with a multi-strip sensor in accordance with the present invention;

[0042] **FIG. 6***a* is a schematic representation of the different polymer coating layers in a laminated sensor for a feedback device according to the present invention;

[0043] **FIG. 6***b* is a graphical representation of the resistance versus the extension for the different polymer coatings of **FIG. 6***a*;

[0044] **FIG. 7***a* is a schematic representation of a feedback device configured for the measurement of pressure;

[0045] **FIG. 7***b* shows a schematic representation of a laminated structure to be used for the measurement of pressure; and

[0046] **FIG. 8** is a schematic sectional view of a feedback device according to the present invention which provides a feedback indication form of the colour change.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0047] It has recently been shown (see De Rossi, D., Della Santa, A., Mazzoldi, A. Material Science Engineering. 1999, C7, 31, the contents of which are incorporated herein by cross-reference), that conducting polymer coated lycra™fabrics can function as strain gauges with minimal changes to the fabric properties incurred after coating. The development of certain embodiments of the present invention has now shown that using appropriate polymerisation conditions or different host fabric structures can modify the dynamic range of these fabric strain gauges.

EXAMPLE PREPARATION OF SENSING STRIPS

[0048] Reagents

[0049] Monomer: Pyrrole (Aldrich): 0.015 M or 1 ml/500 ml H_2O

[0050] Dopant: NDSA (Aldrich): 1,5-Naphthalenedisulfonic acid tetrahydrate 0.005 M or 1.8 gm/500 ml H_2O

[0051] Oxidant: $FeCI_3$ (BDH): Ferric chloride 0.04 M or 25.98 gm/L H_2O

[0052] Procedure

[0053] NDSA and pyrrole are dissolved in water (500 ml). Lycra fabric (4 strips −2 cm×25 cm) are sewn onto wire racks and soaked in the monomer/dopant solution (20 mins). The solution is clear in colour.

[0054] An aliquot of solution (250 ml) is then decanted and an aliquot of $FeCI_3$ (250 ml) added. Initially this solution is yellow.

[0055] The pyrrole in solution begins to be oxidized, after approximately 3 mins, by the $FeCl_3$. The solution turns a green colour.

[0056] Oxidation continues and after 5-6 mins the solution begins to darken to a black colour.

[0057] As oxidation continues further polypyrrole powder settles out of the solution. The process continues until the coated fabric is removed from the solution.

[0058] After 70 mins the lycra strips are coated with a thin layer of polypyrrole and have changed from a white colour to a black colour.

[0059] The strips are dried, removed from the wire rack and washed in several changes of water for 45 mins to remove any residual polypyrrole powder not coated onto the surface of the fabric. The dried washed strips are ready for use.

[0060] Using the set up shown in **FIG. 1**, calibration curves for different polyrnerisation conditions or different host fabrics may be generated. The electrically conductive polymer coated fabric **1** is held under tension between copper foil strips **2**. Applying a force F to the ends of the fabric **1** increases the tensile load and the resultant strain in the fabric causes it to elongate. The elongation of the fabric **1** in turn causes the electrical resistance of the polymer coating structure tochange. The change in resistance associated with the strain caused by force F can be measured using a simple wheatstone bridge arrangement **3** and a voltage sourceV. Ordinary workers in this field will readily understand the operation of a wheatstone bridge whereby a potentiometer Vo measures the change in potential difference between the points shown in **FIG. 1**. Hence, from the potentiometer V_0 and the known resistance of the resistors R_2, this simple set up can be used to generate a set of calibration curves showing the resistance versus strain for various types of fabric and polymerisation conditions. Using these curves, the feedback device can accurately equate electrical resistance with particular movements of a biological structure. It will also be readily appreciated that it would be possible to use many other types of comparitor circuits instead of the wheatstone bridge.